

The Sutton Hoo Ship's Company, The Longshed, Tide Mill Way, Woodbridge, Suffolk IP12 1FP UK

## Size and Shape of the Keel of the Sutton Hoo Ship

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**Abstract:** The remains of the keel of the Sutton Hoo ship were very limited. Considerable efforts were made in 1939 and 1965-70 to explore what was there and to interpret the results. This paper examines these efforts so that a judgement can be made on how to handle a reconstruction. Broadly the 1965-70 interpretation does not conflict with the ideas from 1939, and offers a reasonable way forward.

**Keywords:** Sutton Hoo ship, keel, stem, stern, scarf, garboard, hog, plank.

### 1 Introduction

The remains of the keel of the Sutton Hoo ship were very limited. Considerable efforts were made in 1939 and 1965-70 to explore what was there and to interpret the results. This paper examine these efforts so that a judgement can be made on how to handle a reconstruction. Bruce-Mitford, 1975, suggests a size and shape for a single-component keel, subject to much discussion of the archaeological difficulties encountered and how to interpret them. The picture is internally consistent and agrees with the limited interpretations from 1939. These conclusions can be taken at face value as a best effort.

### 2 The 1939 view

Bruce-Mitford (1975, pp. 375-382) has *Section 3: The Keel*.

This starts by pointing out that the 1939 excavation had devoted only the 23rd August p.m. and the 24<sup>th</sup> August to investigating the keel, the stem and the stern. There are said to be no field records. However, fig. 289 shows photos of two sections Lt. Commander Hutchison cut by ribs 8 and 9. The 1939 photos are also extensively reproduced and used as evidence.

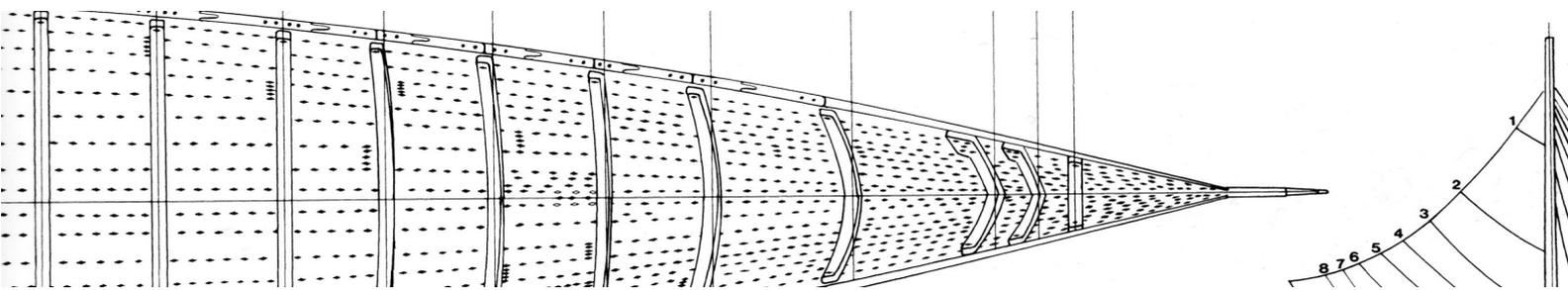
Bruce-Mitford reports from Charles Phillips' diary:

"Sections were cut across the bottom at various points and it was established beyond doubt (a) that the boat had no keel; (b) that the bottom had the same general characteristics as the Nydam boat."

And from his published accounts:

"...we cannot speak with absolute certainty about the details of the bottom. ... with some 20 ft. of the amidships region of the ship badly distorted through having been in the range of the burial chamber, one of the most critical parts of the ship was much disturbed. Sections cut across the keel line gave no indication of a true keel projecting downward from the bottom and the most that could be seen a strong projection 2½ in. deep and 7½ in. wide [cf. fig. 289]. Within the area of the burial-chamber this resolved itself into a more or less straight line and the curved effect was observed between ribs 7 and 8 in an area free from distortion."

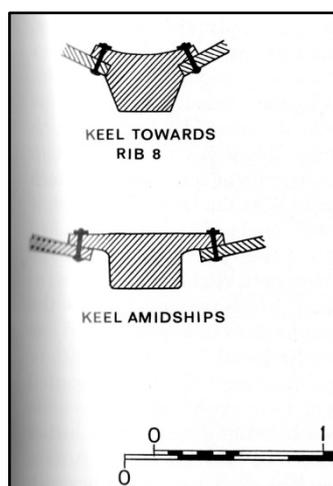
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“Between ribs 7 and 8 [the keel] was rising towards the scarf joining it to the stem-post and the possible rounded form may be another reminiscence of the primitive dug-out which is the ultimate ancestor of all keels.”

Looking ahead, Bruce-Mitford (1975, p. 377) has fig. 290 which shows is a “...suggested cross-section of the ...keel...”. The limited interpretations from 1939 were accepted by the 1967 investigators:



The section towards rib 8 matches the measurements given by Phillips, and reproduces the ‘curved effect/rounded form’. The flat top of the section amidships reflects the absence of features remarked by Phillips.

### 3 The 1966-67 investigation

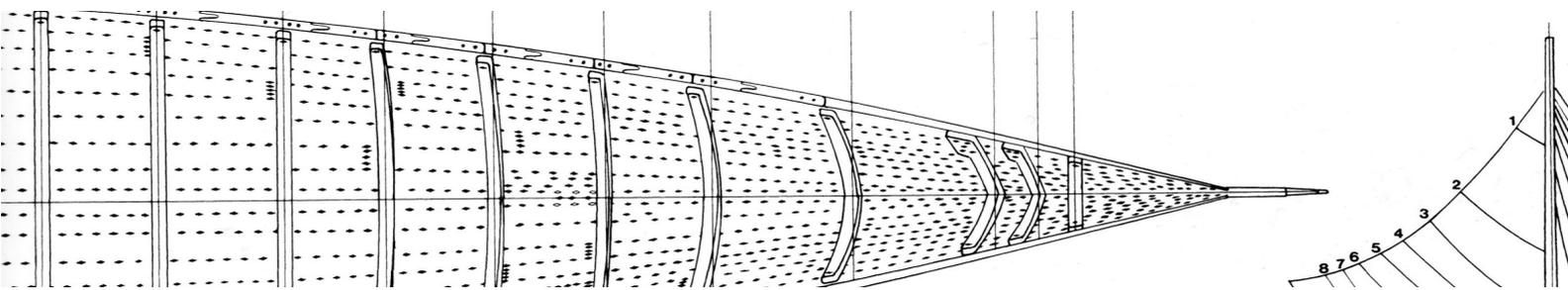
#### 3.1 The approach taken

Bruce-Mitford (1975, Chapter IV) describes the state of the ship as found in 1965, and the approach taken towards the investigation. See Sections 2, 3 and most of 4, pp. 236-277.

There is a wealth of information about how the remains of the ship had been damaged or had deteriorated since 1939, how its back had been broken subsequent to its burial, and how it was listing slightly to starboard. The stern in particular had suffered from abuse when the site was an army training camp in WW2. See fig. 176, p. 250. Sections were taken, mostly forward of the burial chamber, and are illustrated and interpreted in detail pp. 260-270.

Table 17 (p. 265) gives information on the depth of projection below the hull at various points along it. Only sections H and I relate to the keel proper – they on either side of rib 17 and only 2½ in. apart. The projections were 2 in. and 3 in. Generally the sections are difficult to interpret, changing suddenly in nature along the length of the ship.

The other detailed sections of the keel proper are described in Appendix A to Chapter IV, pp. 296-300. In this case an embedded portion of the keel plank between ribs 6 and 7 was lifted on an iron plate, stabilised, and transported to the British Museum for investigation. The plate bowed slightly and there was some cracking.



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Sections were taken and recorded where the sample allowed it, without crumbling. The detailed drawings in fig. 216, pp. 298-9 show the rapid changes along the length of the keel, and the difficulties in interpretation. The very last paragraph on p 300 talks about the size and shape of the keel-plank, and it is referenced to fig. 290 on p. 377 (which actually relates to rib 8). The description and the measurements all tie up.

[By the way, the scale at the bottom fig. 216(a) on p. 298 seems to be wrong by roughly a factor of two].

### 3.2 Analysis and interpretation

Bruce-Mitford (1975, Chapter V) covers this in *Section 3: The Keel*, on pp. 375-382.

Some of it is not very encouraging:

- "... between ribs 7 and 8 and rib 17, a distance of some 28 feet (8.6 m) the parallel line of rivets that joined the keel and the garboard strakes was completely lost." (p. 376)
- "..., despite the recovery of as much evidence as possible, our knowledge of the structure of the keel-plank is still not wholly complete, and never can be." (p. 377)

However, "one of the major achievements of the re-excavation of the ship was to record the position of every rivet (Map Pocket, cards 1-8)." (p. 377). So the 1966-7 evidence is as complete as it can be.

The cards can be compared to fig. 325 on p. 435, which is a very useful summary of the 1939 photographic record. It is a considered view of where all the rivets were, taking on board the 1966-7 evidence where available. It takes a position on the widths between the rivets used to attach the garboards to the keel-plank along its whole length. Amidships that width is about 8-10 in., agreeing with what is stated on p. 378. Allowing two inches for overlap with the garboard strakes on each side, the width of the top of the keel-plank is 'perhaps as much as 14 inches', and it does not taper much towards the scarfs for the stem and stern.

Based on evidence discussed in *Section 5: The scarfs and their position* (starting p. 392), fig. 325 gives the position of the three rivets used for the scarf where the stern post was attached, just forward of rib 21. It also shows where it believes the scarf joint to the stem was located, using three hypothetical treenails just aft of rib 5. From these positions the implied length of the keel is about 48 feet overall, including the scarfs.

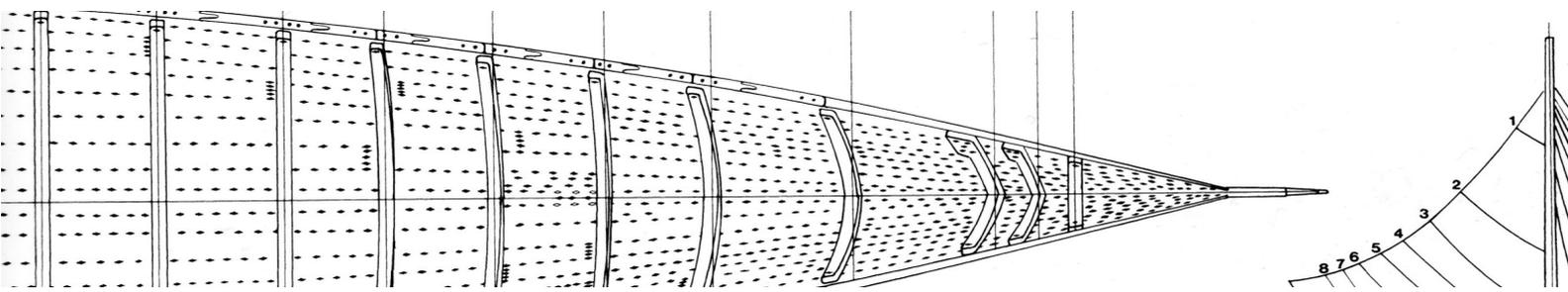
The story of how and where the stem and stern were scarfed to the keel is quite complicated, and there are other possibilities for the length and nature of the keel. From p. 398: 'To summarise: the alternatives are: (1) a single scarf between ribs 21 and 20 and ribs 5 and 6 (giving a flat keel with a length of 46 ft. [12 m]); (2) a single scarf between ribs 22 and 23 and ribs 3 and 4, giving a keel with a substantial curve at each end and a total length of 57 ft. [17.4 m]; (3) a double scarf with a lower join at ribs 21 and 6 and an upper join near ribs 23 and 3.'

Generally, the shapes of fig. 290 on p. 377 are supported, including evidence from the rivets that the garboards and the 'wings' of the keel plank were each an inch thick. Also some of the roves (which were always inboard) were slightly tilted in a way consistent with this shape (p. 381).

### 4 Does Volume 1 imply a two-component keel plank?

Discussing the keel, Bruce-Mitford (1975, Chapter V, p. 378, p. 381) uses the word 'hog' five times.

Two definitions of 'hog' from the internet are:



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- A structural board installed on top of the keel to help attach the garboard plank.
- The primary main structural longitudinal member fitted immediately above the keel and running from the forward to the after deadwood. The inner edges of the garboard strakes are attached to the outer edges of the hog.

So it could be taken that Volume I is implying a two-component keel.

However, the first mention of 'hog', at the top of p. 378 uses scare quotes. When used at the top of p. 381, there is a footnote to say the word is referring to 'the flat upper *surface* of the keel-plank'. The next two mentions put the word inside scare quotes. The final mention is the slightly problematic one, as the 'hog' is missing any quotes, and it might be interpreted to have become something solid and separate.

All the same, if there had been serious thoughts about a two-component keel-plank it would have been odd not to mention them on p. 375 at the beginning of *Section 3 : The keel*. Also figs. 290, 291 and 292 all show the section of the bottom structural member as one piece. Finally, if you are starting with half of a tree-trunk it would seem more natural to keep it all in one piece.

## 5 Conclusions

Bruce-Mitford, 1975, suggests a size and shape for a single-component keel, subject to much discussion of the archaeological difficulties encountered and how to interpret them. The picture is internally consistent and agrees with the limited interpretations from 1939. These conclusions can be taken at face value as a best effort.

The sizes and shapes themselves are covered in section 3.2 above.

## 6 Sources of information

BRUCE-MITFORD R., 1975. *The Sutton Hoo Ship Burial, Volume I*. London. British Museum.